

Atty. Dkt. 160-398  
YA-03S1066

# ***U.S. PATENT APPLICATION***

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***Invention:*** SPECIMEN DISPENSING SYSTEM

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## ***SPECIFICATION***

TITLE OF THE INVENTION  
SPECIMEN DISPENSING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the  
5 benefit of priority from the prior Japanese Patent  
Application No. 2002-347584, filed November 29, 2002,  
the entire contents of which are incorporated herein by  
reference.

BACKGROUND OF THE INVENTION

10 1. Field of the Invention

The present invention relates to a specimen  
dispensing system for dispensing specimens such as  
blood and urine.

2. Description of the Related Art

15 Jpn. Pat. Appln. KOKAI Publication No. 10-227800  
discloses a prior art specimen dispensing system. This  
system is so configured that a specimen in a specimen  
container on a master line is dispensed to its  
corresponding specimen containers on a plurality of  
20 (two) slave lines by a plurality of (two) nozzles.

FIGS. 3 and 4 illustrate a specimen dispensing  
system that is substantially the same as the above  
prior art system. The system shown in FIGS. 3 and 4  
includes first to sixth conveyor lanes 1 to 6. The  
25 first to third conveyor lanes 1 to 3 convey master  
specimen containers 11 to 13 and the fourth to sixth  
conveyor lanes 4 to 6 convey slave specimen containers

21 to 23. Master specimens are removed from the master specimen containers 11 to 13 and dispensed to the slave specimen containers 21 to 23, which are empty, using first to third dispensing nozzles N1 to N3, respectively.

After the dispensing, the master specimen containers 11 to 13 are returned by a return lane 7. The slave specimen containers 21 to 23 are returned by a return lane 8. In FIGS. 3 and 4, reference symbol La indicates a dispensing tip mounting position and reference symbol Lb indicates a dispensing tip discarding position. The first to third dispensing nozzles N1 to N3 can be moved in a direction crossing the conveyor lanes (right and left directions in FIGS. 3 and 4) by a dispensing nozzle moving mechanism S (see FIG. 4) that is controlled by a controller (not shown). In FIG. 3, NP1 to NP3 represent moving positions of the first to third dispensing nozzles N1 to N3, respectively.

Pay attention to the movement of, for example, the first dispensing nozzle N1 in the above dispensing operation. Referring to FIG. 4, the nozzle N1 discards a used dispensing tip Tb in the dispensing tip discarding position Lb and mounts a new dispensing tip Ta in the dispensing tip mounting position La. After that, the nozzle N1 moves to the first conveyor lane 1 and removes a master specimen from the master specimen

container 11. The nozzle N1 moves to the position of the empty slave specimen container 21 on the fourth conveyor lane 4 and dispenses the master specimen to the container 21. Then, the nozzle N1 returns to the original position. The second and third dispensing nozzles N2 and N3 perform the same operation.

The above prior art specimen dispensing system causes the following disadvantage if the dispensing nozzles N1 to N3 are quickly moved in order to perform a dispensing operation at high speed. When the dispensing nozzles N1 to N3 move beyond a fixed speed, the removed specimens are likely to be scattered due to a shock caused when the nozzles are stopped, though there are differences in the shape and size of dispensing tips mounted on the nozzles N1 to N3 and the type of specimens. If the specimens are scattered, not only they decrease in amount but also a so-called contamination occurs, thus causing serious problems.

In order to avoid the above problems, each of the dispensing nozzles restricts its moving speed by itself. The nozzles therefore decrease in throughput. To provide a number of dispensing nozzles, however, increases the size of the system.

#### BRIEF SUMMARY OF THE INVENTION

An object of the present invention is to provide a specimen dispensing system having the following advantages.

The time required for moving a dispensing nozzle can greatly be shortened.

It is unlikely that no specimens will be scattered even though a dispensing nozzle moves at high speed.

5       The size of the specimen dispensing system is small but the throughput thereof is large.

In order to attain the above object, a specimen dispensing system according to the present invention has the following characteristic configuration. The  
10       other characteristic configurations will be clarified in the embodiment.

A specimen dispensing system according to an embodiment of the present invention comprises:

conveying means for conveying a master specimen  
15       container containing a specimen and a required number of empty slave specimen containers on a conveyor lane, the master and slave specimen containers being aligned in a conveyance direction;

stopping means for temporarily stopping the master  
20       and slave specimen containers when the master and slave specimen containers reach a position under a dispensing nozzle in a dispensing unit; and

dispensing means for removing the specimen from  
the master specimen container by the dispensing nozzle  
25       when the master specimen container is temporarily stopped in the position under the dispensing nozzle by the stopping means and dispensing the specimen to the

slave specimen containers when the slave specimen containers are temporarily stopped in the position under the dispensing nozzle.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

5           FIG. 1 is a schematic plan view of a specimen dispensing system according to an embodiment of the present invention.

          FIG. 2 is an illustration explaining the movement of a first dispensing nozzle of the specimen dispensing system according to an embodiment of the present invention.

          FIG. 3 is a schematic plan view showing a configuration of a prior art specimen dispensing system.

15           FIG. 4 is an illustration explaining the movement of a first dispensing nozzle of the prior art specimen dispensing system.

#### DETAILED DESCRIPTION OF THE INVENTION

(Embodiment)

20           FIGS. 1 and 2 illustrate a specimen dispensing system according to an embodiment of the present invention. The system includes first, second and third conveyor lanes 1, 2 and 3. A conveying means (not shown) conveys a master specimen container 11 containing a specimen and a required number of empty slave specimen containers 21 and 31 on the first conveyor lane 1. It conveys a master specimen

container 12 containing a specimen and a required  
number of empty slave specimen containers 22 and 32 on  
the second conveyor lane 2. It conveys a master  
specimen container 13 containing a specimen and a  
5 required number of empty slave specimen containers 23  
and 33 on the third conveyor lane 3. The master and  
slave specimen containers are aligned in the conveyance  
direction on their respective lanes.

When the master specimen container 11 and empty  
10 slave specimen containers 21 and 31 on the first  
conveyor lane 1 reach a position under a first  
dispensing nozzle N1 in a dispensing unit, they are  
stopped by a stopping means (not shown).

When the master specimen container 12 and empty  
15 slave specimen containers 22 and 32 on the second  
conveyor lane 2 reach a position under a second  
dispensing nozzle N2 in the dispensing unit, they are  
stopped by a stopping means (not shown).

When the master specimen container 13 and empty  
20 slave specimen containers 23 and 33 on the third  
conveyor lane 3 reach a position under a third  
dispensing nozzle N3 in the dispensing unit, they are  
stopped by a stopping means (not shown).

The first to third dispensing nozzles N1 to N3 are  
25 moved in a direction crossing the conveyor lanes (right  
and left directions in FIGS. 1 and 2) by a dispensing  
nozzle moving mechanism S that is controlled by

a controller (not shown). In FIG. 1, NP1 to NP3 indicate moving positions of the first to third dispensing nozzles N1 to N3, respectively.

5 When the master specimen containers 11, 12 and 13 stop in positions under the dispensing nozzles N1, N2 and N3, the nozzles N1, N2 and N3 remove specimens from the master specimen containers 11, 12 and 13, respectively.

10 When the slave specimen container 21 temporarily stops in a position on the first conveyor lane 1 under the first dispensing nozzle N1, the specimen is dispensed to the slave specimen container 21 from the first dispensing nozzle N1. Similarly, when the slave specimen container 31 temporarily stops in a position  
15 on the first conveyor lane 1 under the first dispensing nozzle N1, the specimen is dispensed to the slave specimen container 31 from the first dispensing nozzle N1.

20 When the slave specimen container 22 temporarily stops in a position on the second conveyor lane 2 under the second dispensing nozzle N2, the specimen is dispensed to the slave specimen container 22 from the second dispensing nozzle N2. Similarly, when the slave specimen container 32 temporarily stops in a position  
25 on the second conveyor lane 2 under the second dispensing nozzle N2, the specimen is dispensed to the slave specimen container 32 from the second dispensing



nozzle N2.

When the slave specimen container 23 temporarily stops in a position on the third conveyor lane 3 under the third dispensing nozzle N3, the specimen is  
5 dispensed to the slave specimen container 23 from the third dispensing nozzle N3. Similarly, when the slave specimen container 33 temporarily stops in a position on the third conveyor lane 3 under the third dispensing  
10 nozzle N3, the specimen is dispensed to the slave specimen container 33 from the third dispensing nozzle N3.

After the dispensing, the master specimen containers 11 to 13 and slave specimen containers 21 to 23 and 31 to 33 are all returned by a return lane 4.  
15 In FIGS. 1 and 2, reference symbol La indicates a dispensing tip mounting position and reference symbol Lb indicates a dispensing tip discarding position.

Pay attention to the movement of, for example, the first dispensing nozzle N1 in the above dispensing  
20 operation. Referring to FIG. 2, the first dispensing nozzle N1 discards a used dispensing tip Tb in the dispensing tip discarding position Lb and mounts a new dispensing tip Ta in the dispensing tip mounting  
25 position La. After that, the nozzle N1 moves onto the first conveyor lane 1 and removes a master specimen from the master specimen container 11. The nozzle N1 stands still in this position afterward. When the

slave specimen container 21 moves on the first conveyor lane 1 and stops in a position under the first dispensing nozzle N1, the nozzle N1 dispenses the specimen to the specimen container 21. Similarly, when  
5 the slave specimen container 31 moves on the first conveyor lane 1 and stops in a position under the first dispensing nozzle N1, the nozzle N1 dispenses the specimen to the specimen container 31. When the above dispensing operation is completed, the first dispensing  
10 nozzle N1 returns to the original position.

The moving range in which the first dispensing nozzle N1 moves for its dispensing operation is only the one indicated by arrow R1. Comparing the moving range with the moving range ( $R1 + R1X$ ) of the first  
15 dispensing nozzle N1 of the prior art system, the conventionally-required moving range R1X becomes unnecessary. The moving range R1 is one in which a dispensing tip containing almost no specimen moves. In other words, the moving range R1 corresponds to the sum  
20 of a process performed until a new tip Ta is mounted on the first dispensing nozzle N1 in the stage prior to the dispensing of a master specimen and a process performed until the used dispensing tip Tb is discarded in the dispensing tip discarding position Lb after the  
25 specimen is dispensed to the slave specimen container.

The second and third dispensing nozzles N2 and N3 perform the same operation as described above.

(Features of the Embodiment)

[1] A specimen dispensing system according to an embodiment, comprises:

conveying means for conveying a master specimen  
5 container 11 containing a specimen and a required  
number of empty slave specimen containers 21 and 31 on  
a conveyor lane 1, the master and slave specimen  
containers being aligned in a conveyance direction;

stopping means for temporarily stopping the master  
10 and slave specimen containers 11, 21 and 31 when the  
master and slave specimen containers 11, 21 and 31  
reach a position under a dispensing nozzle N1 in  
a dispensing unit; and

dispensing means for removing the specimen from  
15 the master specimen container 11 by the dispensing  
nozzle N1 when the master specimen container 11 is  
temporarily stopped in the position under the  
dispensing nozzle N1 by the stopping means and  
dispensing the specimen to the slave specimen  
20 containers 21 and 31 when the slave specimen containers  
21 and 31 are temporarily stopped in the position under  
the dispensing nozzle N1.

According to the above specimen dispensing system,  
the moving range R1 in which the dispensing nozzle N1  
25 moves for its dispensing operation is reduced more than  
the moving range (R1 + R1X) of the prior art system by  
the range indicated by arrow R1X. Consequently, the

moving time of the nozzle in the range R1X becomes zero  
and is therefore shortened. The total width of the  
conveyor lanes is about 1/2 that of the conveyor lanes  
of the prior art system. The moving range R1 is one in  
5 which a dispensing tip containing almost no specimen  
moves. It is thus unlikely that the specimen will be  
scattered even though the dispensing nozzle N1 moves at  
high speed. Since, moreover, the moving time of the  
nozzle N1 is shortened and the moving speed thereof is  
10 enhanced, its throughput can be enhanced without  
increasing the number of dispensing nozzles. Thus, the  
specimen dispensing system of the present invention can  
be decreased in size but increased in throughput.

[2] In the specimen dispensing system according to  
15 above item [1], the specimen is dispensed to the slave  
specimen containers 21 and 31 from the master specimen  
container 11 on the conveyor lane 1 concurrently with  
dispensing operations on other conveyor lanes 2, 3...